Ham-Space Digest   Wed, 15 Jun 94   Volume 94 : Issue 157

Today's Topics:
                    PRO-2006 as satellite receiver
                Satellite Tracking Hardware (2 msgs)
                          space shuttle

We trust that readers are intelligent enough to realize that all text
herein consists of personal comments and does not represent the official
policies or positions of any party. Your mileage may vary. So there.

Date: 14 Jun 1994 11:11:57 -0400
From: ihnp4.ucsd.edu!usc!howland.reston.ans.net!spool.mu.edu!torn!nott!cunews!
freenet.carleton.ca!freenet3.scri.fsu.edu!freenet3.scri.fsu.edu!not-for-
mail@network.ucsd.edu
Subject: PRO-2006 as satellite receiver
To: ham-space@ucsd.edu

A few years ago I bought a PRO-2006 scanner with the hopes
that I could use it to receive the OSCAR satellites. As it
turns out this versatile programmable scanner can be used in
the down link for all the digital satellites to date. Here
are the modifications and operating procedures that I have
used with the PRO-2006 scanner for use as the down link
receiver for the digital OSCAR satellites.

First of all, in response to several questions, the PRO-2006
will receive 1200 baud AFSK (typical terrestrial packet and
DOVE DO-17 (145.825MHz) telemetry) without modification.
Simply connect the external speaker jack to a TNC. Any TNC
that will work with terrestrial packet BBSs will demodulate

DO-17 telemetry. A 2 Meter antenna typical of that used for FM voice or packet will suffice. (DO-17 also transmitted synthesized voice shortly after launch in 1990 and I understand will be doing so again soon, after a long silence). I use a couple of adapters that came from Radio Shack to adapt my type N and PL259 coax connectors to the PRO-2006's BNC antenna jack. I don't think that the little telescoping antenna will pick up DO-17 well enough to demodulate much telemetry.

My next attempt at satellite reception was PACKSAT AO-16. This satellite transmits 1200 baud PSK modulation. In addition to the PRO-2006 I use my HF rig, a Kenwood TS-430S, and an L.L.GRACE DSP-12 TNC. Since the PRO-2006 doesn't demodulate single sideband I use it as a very wide band down converter feeding signals to my HF rig. This is a very simple modification. I tapped off the cathode of D33 with a 10pf capacitor and a few inches of RG 174 coax to a phono/video type connector that I added to the back panel. D33 is inside the top cover about 3 inches back from the front panel and 2 inches over from the left side of the linear PC board. The glass cased diode is end mounted and the cathode is the end pointing up.

This gives you access to the 455KHz final IF signal just prior to the PRO-2006's demodulator circuitry. The signal has a bandwidth of about 8 to 10 KHz. My HF rig has a transverter input on the back that I connect this signal to. You could also connect it directly to the HF rig's antenna jack but if you were to accidentally key the HF transmitter the PRO-2006 would be toast! Next tune your HF rig to 455KHz upper sideband and, using AO-16 as an example, the PRO-2006 to 437.050 MHz. Because the signal bandwidth is at least 8 KHz wide you can tune your HF rig to cover much of the Doppler shift during a pass. When your HF rig's dial reads 451 KHz you will be receiving 437.046 MHz. The DSP-12 (and other PSK TNCs) uses a phase locked loop to track Doppler shift by generating "mike click" signals. These you send to your HF rig. This setup will work with AO-16, WO-18, LO-19, FO-20 and IO-26 (although I haven't tried IO-26).

440 MHz signals are subject to much more attenuation in the coax than 144 MHz signals. I needed 50 feet of coax to get above the trees and even with very high quality coax (4XL) I needed a mast mounted preamp. The preamp made a huge difference.

The above modification also lets you use your HF rigs entire

front end, including the signal strength meter, at any frequency that the PRO-2006 will receive. Try listening to some of the odd signals across the bands in SSB or with your HF rigs FM section. Very interesting.

Next I was ready to tackle the 9600 baud FSK satellites. This requires an additional modification, as simple as, and much like the one described above. 9600 baud FSK data contains wave form components that are too high in frequency to make it through the audio amplifier section of most, if not all, radio receivers. This, by the way, leads to the rather confusing fact that if you tune in to a 9600 baud FSK signal you will not hear anything that sounds like 1200 baud AFSK or PSK. What will happen is that the signal will solidly break the squelch but it will sound very much like background noise. "T" the output from this modification out to an oscilloscope however and you can readily see the difference. With experience you can hear the difference as well.

Make this modification exactly like the last one but leave out the capacitor. Solder the center conductor of the coax to TP2. That's it. TP2 is located about one quarter of an inch toward the left front corner of the PC board from diode D33 where the previous coax was terminated. It looks like an end mounted resistor with no bands on it and the top lead cut off short. Run this signal to the 9600 baud FSK input of your TNC, tune to a 9600 baud satellite and if everything worked at 1200 baud you should have no problem at 9600.

There is a serendipitous feature of the PRO-2006 that provides automatic Doppler compensation with 9600 baud FSK. I will use UO-22 which transmits on 435.120 MHz as an example. The PRO-2006 has 10 programmable "limit search" memories (enough for 10 satellites). Program the upper limit of search to 435.130 MHz and lower limit to 435.110 MHz. Then press the down arrow so that the search progresses from higher to lower frequencies, the direction of Doppler shift. Set the squelch at about one and a half and the radio will lock onto the signal when the satellite comes into range, then follow the Doppler shift until it goes out of range. When the signal fades deep enough to return to search mode the search wraps around and locks on again within fractions of a second after the signal returns. Use the delay option to minimize return to search mode. With the frequencies for each satellite programmed into a different limit search memory you can change satellites with the press of a single button.

Considering the price of radio equipment I think the PRO-
2006 with these modifications gives you very good "bang for
the buck". Many people already own an HF rig and a 2 meter
rig by the time they decide to get into the satellites. All
mode 440 MHz rigs are quite pricy and AO-21 is the only low
earth orbit satellite with a 440 MHz uplink.

Anyway I hope this helps. Good luck.

Bruce N4USH

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Bruce M. Marshall bmm1@freenet.fsu.edu voice 615 481 0990 fax 615 481 8039

Date: Tue, 14 Jun 1994 10:51:00 GMT
From: ihnp4.ucsd.edu!swrinde!cs.utexas.edu!utnut!torn!news.unb.ca!upei.ca!UPEI.CA!
seeler@network.ucsd.edu
Subject: Satellite Tracking Hardware
To: ham-space@ucsd.edu

In article <940613151708@kendurham.sc.ti.com> ken@fstop.csc.ti.com (Ken Durham)
writes:
>From: ken@fstop.csc.ti.com (Ken Durham)
>Subject: Satellite Tracking Hardware
>Keywords: satellite
>Date: Mon, 13 Jun 1994 15:17:08 GMT
>Dialing WWV to calibrate the PC system clock has shown that the error is too
>large to be able to track the low earth orbiting satellites without calibrating
>several times a week. This could get expensive since the call is long distance.
>
>Does anyone know of a plug-in board intended to take over the clock's time
>function with greater accuracy?
>
>The computer clock problem seems to be a common one (from comments heard on
>AO-13.) Any info on the subject would help.
>
>Ken Durham K5MBV
>

Sorry to post here but mail to your address bounced.

Try a shareware package - Rightime and Settime. This package does two
things very well in my initial try-out:

1. Settime: sets computer clock automatically via connection to US

Naval Observatory.

2. Rightime: Keeps computer clock (DOS AND CMOS) to within 0.1 seconds
          over time after system is set (takes 3 - 6 time sets or
          calls - I used WWV twice over 24 hours and then Settime
          twice. Over 2 weeks the program did an excellant job.

One caveat - rightime uses the serial interrupts in doing its job so get
the most recent version as there are switches in the program to sense when
serial ports are used and it stops using the interrupts. Over the time I
tried it - the program worked very well and I have had only a few overruns
in DOS at 19.200 operating KO-23 or KO-25. Will try WISP later and
I suspect the buffers and 16550s will eliminate overruns.

THe two programs are avilable at Air Systems Technologies BBS:

(214) 869-2780

they are listed as:

Tset.... .zip
ritm.... .zip

.... : equate to the version number

73 for now - DAve Seeler, VY2DCS
Internet: Seeler@upei.ca

Date: Tue, 14 Jun 1994 18:13:27 GMT
From: ihnp4.ucsd.edu!usc!howland.reston.ans.net!sol.ctr.columbia.edu!
news.ess.harris.com!p15jg.ess.harris.com@network.ucsd.edu
Subject: Satellite Tracking Hardware
To: ham-space@ucsd.edu

In Article <940613151708@kendurham.sc.ti.com> "ken@fstop.csc.ti.com (Ken Durham)"
says:
> Dialing WWV to calibrate the PC system clock has shown that the error is too
> large to be able to track the low earth orbiting satellites without calibrating
> several times a week. This could get expensive since the call is long distance.
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>

> Ken Durham K5MBV
>
>
Judging from the K5MBV, I would think the obvious solution would be to use
WWV HF service on 2.5, 5.0, 10.0 or 15.0 MHZ would be an easy solution to
the cost problem.

Your manual setting of the clock ought to be within a second or so, which
seems close enough unless you have a _real_ narrow beam.

Another choice would be to use this problem as an excuse to buy yourself
a hand-help marine GPS receiver for about $500.00, about the cost of a
specialized pc-card. I think some of them will display the time that they
use for their position calculation.

   R.C. LOKERSON (BOB)   MAIL ADDRESS: VOICE : 407.729.2257
   HARRIS MDSO/MIS/DCC/ATG   HARRIS E.S.S.   SMTP : RLOKER01@HARRIS.COM
   BLDG 15/RM 838   P.O. BOX 37   CCMAIL: RLOKER01
   PALM BAY, FLORIDA   MELBOURNE FL   FCC   : WA3PKX
                            32902   HOME : 407.725.8024

   (I WROTE IT, NOT MR. HARRIS)

   "ANYONE WHO WEARS A TIE TO SHOW HOW SMART HE IS CANNOT BE VERY SMART"

Date: Tue, 14 Jun 94 00:02:00 +0000
From: ihnp4.ucsd.edu!swrinde!cs.utexas.edu!utnut!torn!uunet.ca!uunet.ca!softbbs!
jeff.podeszwa@network.ucsd.edu
Subject: space shuttle
To: ham-space@ucsd.edu

I ask this question with maturity....Is there a E-mail address on the
space shuttle?

 * 1st 1.11 * Romulan warbird decloaking sir... ..[.... NO CARRIER

End of Ham-Space Digest V94 #157
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